1   WHAT IS CLAIMED IS:

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             1.   A microphone array apparatus comprising:
             a microphone array including microphones,
     one of the microphones being a reference microphone;
             filters receiving output signals of the
10   microphones; and
             a filter coefficient calculator which
     receives the output signals of the microphones, a
     noise and a residual signal obtained by subtracting
     filtered output signals of the microphones other than
15   the reference microphone from a filtered output signal
     of the reference microphone and which obtain filter
     coefficients of the filters in accordance with an
     evaluation function based on the residual signal.

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             2.   The microphone array apparatus as
     claimed in claim 1, further comprising:
25   delay units provided in front of the
     filters; and
             a delay calculator which calculates amounts
     of delays of the delay units on the basis of a maximum
     value of a crosscorrelation function of the output
30   signals of the microphones and the noise.

35   3.   The microphone array apparatus as
     claimed in claim 1, wherein the noise is a signal
     which drives a speaker.

1   4. The microphone array apparatus as
claimed in claim 1, further comprising a supplementary
microphone which outputs the noise.

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       5. The microphone array apparatus as
claimed in claim 1, wherein the filter coefficient
10 calculator includes a cyclic type low-pass filter
which applies a comparatively small weight to memory
values of a filter portion which executes a
convolutional operation in an updating process of the
filter coefficients.

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       6. A microphone array apparatus comprising:
20   a microphone array including microphones;
          linear predictive filters receiving output
signals of the microphones;
          linear predictive analysis units which
receives the output signals of the microphones and
25 update filter coefficients of the linear predictive
filters in accordance with a linear predictive
analysis; and
          a sound source position detector which
obtains a crosscorrelation coefficient value based on
30 linear predictive residuals of the linear predictive
filters and outputs information concerning the
position of a sound source based on a value which
maximizes the crosscorrelation coefficient value.

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7. The microphone array apparatus as claimed in claim 6, wherein:

a target sound source is a speaker; and

the linear predictive analysis unit updates the filter coefficients of the linear predictive filters by using a signal which drives the speaker.

8. A microphone array apparatus comprising:

a microphone array including microphones;

a signal estimator which estimates positions of estimated microphones in accordance with intervals at which the microphones are arranged by using the output signals of the microphones and a velocity of sound and which outputs output signals of the estimated microphones together with the output signals of the microphones forming the microphone array; and

a synchronous adder which pulls phases of the output signals of the microphones and the estimated microphones and then adds the output signals.

9. The microphone array apparatus as claimed in claim 8, further comprising a reference microphone located on an imaginary line connecting the microphones forming the microphone array and arranged at intervals at which the microphones forming the microphone array are arranged,

wherein the signal estimator which corrects the estimated positions of the estimated microphones and the output signals thereof on the basis of the output signals of the microphones forming the

1   microphone array.

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         10.   The microphone array apparatus as
claimed in claim 9, further comprising an estimation
coefficient decision unit weights an error signal
which corresponds to a difference between the output
10 signal of the reference microphone and the output
signals of the signal estimator in accordance with an
acoustic sense characteristic so that the signal
estimator performs a signal estimating operation on a
band having a comparatively high acoustic sense with a
15 comparatively high precision.

20   11.   The microphone array apparatus as
claimed in claim 8, wherein:
         given angles are defined which indicate
directions of a sound source with respect to the
   microphones forming the microphone array;
25   the signal estimator includes parts which
are respectively provided to the given angles;
         the synchronous adder includes parts which
are respectively provided to the given angles; and
         the microphone array apparatus further
30 comprises a sound source position detector which
outputs information concerning the position of a sound
source based on a maximum value among the output
signals of the parts of the synchronous adder.

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1   12.   A microphone array apparatus
comprising:
          a microphone array including microphones;
          , a sound source position detector which
5   detects a position of a sound source on the basis of
output signals of the microphones;
          a camera generating an image of the sound
source;
          a second detector which detects the position
10   of the sound source on the basis of the image from the
camera; and
          an integrate decision processing unit which
outputs information indicating the position of the
sound source on the basis of the information from the
15   sound source position detector and the information
from the second detector.

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